

REVISION OF THE *COLOMBIANA* SPECIES GROUP OF THE GENUS  
*HEXACHAETA* LOEW (DIPTERA: TEPHRITIDAE)

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*Abstract.*—The *colombiana* species group of the Neotropical genus *Hexachaeta* Loew is revised. The group includes one described species, *H. colombiana* Lima 1953 and four new species: *H. ecuatoriana*, *H. leptofasciata*, *H. bifurcata*, and *H. nigriventris* from several regions of tropical America. A key for separation of all species is presented, and the most important characters for distinguishing each species are illustrated.

*Resumen.*—En este estudio se hace una revisión de las especies del grupo *colombiana* comprendidas en el género neotropical *Hexachaeta* Loew. Este grupo incluye una especie descrita, *H. colombiana* Lima, y cuatro especies nuevas para la ciencia: *H. ecuatoriana*, *H. leptofasciata*, *H. bifurcata*, y *H. nigriventris*, las cuales proceden de varias regiones tropicales de América. Se presenta una clave para la separación de todas las especies y se describen e ilustran los caracteres más importantes que distinguen a cada una de ellas.

*Key Words:* *Hexachaeta*, *colombiana* group, new species

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Currently the genus *Hexachaeta* Loew is recognized as a group exclusively distributed in America and mainly in the Neotropics. This genus comprises 25 described species, to date recorded from the southern United States (southern Texas) to Argentina (Foote 1967).

*Hexachaeta* belongs to the subfamily Trypetinae, but its tribal affinities are not clear. Some authors such as Foote (1980), have discussed its possible relationship with the Old World tribe Acanthonevrini, and other American genera such as *Blepharoneura* Loew, *Ceratodacus* Hendel, *Pyrgotoides* Curran, and *Ischyropter* Bigot, mainly based on the presence of a plumose arista and/or six scutellar bristles.

*Hexachaeta* lacks other diagnostic characters of the tribe Acanthonevrini such as an aculeus tip not fused, spermathecae without denticles on surface, and subapical

tactile setae in the aculeus tip (sensu Hancock 1986). Extreme reduction of ocellar bristles is also present in some *Hexachaeta* species.

In recent studies analyzing ribosomal mitochondrial DNA (16S) in diverse tephritid species (including *H. amabilis* (Loew)), Han and McPherson (1997) have proposed that *Hexachaeta* has a close phylogenetic relationship with the tribe Toxotrypanini (sensu Foote et al. 1993) which comprises the genera *Anastrepha* Schiner and *Toxotrypana* Gerstaecker. Han and McPherson's (1997) hypothesis reconfirms the monophyly of the Toxotrypanini and suggest that the genus *Hexachaeta* is a possible sister group of the tribe.

Loew (1873), Hendel (1914), Lima (1935, 1953a, 1953b, 1954), and Lima and Costa Leite (1952) have made the most extensive taxonomic work in *Hexachaeta*, and

they described most of the currently known species.

To date, the infrageneric classification of *Hexachaeta* has not been well understood. Lima (1935) recognized two species groups, the first that he denominated *amabilis* including the species *H. amabilis*, *H. obscura* Hendel, and later *H. shannoni* Lima (Lima 1953a); and a second group named only "group 2," distributed into "two divisions," but the characters that define each one of them were used with ambiguity.

At the moment, this genus is being revised in a general context, using characters of male and female terminalia that previously were not used for their classification (Hernández-Ortiz, in prep.).

In this study I describe the *colombiana* species group based on the revision of specimens from diverse regions of the Neotropics. It includes *H. colombiana* and four closely related new species which are recognized mainly on the basis of differences in their female terminalia.

#### MATERIAL AND METHODS

Specimens from various countries of Central and South America were examined and their terminalia dissected and stored following the technique described by Gurney et al. (1964). Acronyms used in the text belong to the institutions where study material is deposited: CAS, California Academy of Sciences, San Francisco, USA; CNC, Canadian National Collection Ottawa, Canada; FML, Fundación Miguel Lillo, Tucumán, Argentina; IEXA, Instituto de Ecología, Xalapa, México; INBIO, Instituto Nacional de Biodiversidad, Costa Rica; USNM, National Museum of Natural History, Smithsonian Institution, Washington DC, USA; USP, Universidade de São Paulo, São Paulo, Brazil.

Nomenclature for the general morphological terminology of adults follows McAlpine (1981), whereas that for the female terminalia follows Norrbom and Kim

(1988), and for the wing pattern Foote (1981).

#### THE *COLOMBIANA* SPECIES GROUP

**Description.**—*Head:* Ocellar bristle usually well developed (at least as long and strong as postocellar bristle); postocellar bristle black or reddish brown; fascial carina very reduced or inconspicuous.

*Thorax:* Scutum yellow or pale reddish, and usually without blackish bands or stripes including posterior margin; scutellum usually of same color of scutum; mediotergite yellow or reddish; dorsocentral bristle located near midpoint between supra-alar and postalar bristles.

*Wings:* Posteroapical extension of cell cup moderately long but less than one half length of main part of body of cell. Vein Cu with dorsal microsetae present (usually before fork of Cu1 and Cu2); distance between r-m and dm-cu less than length of dm-cu; vein r-m located distal to level of apex of R1. Radial cells with two elongate hyaline marks distal to apex of R1, first extended into br, and second usually extended to inferior wing margin or at least well introduced into discal cell (Figs. 1A–E); anterior apical band discrete broad or slender (3–4 times as broad as costal vein); posterior apical band present; discal and subapical bands usually separated along entire length but sometimes joined along vein Cu1 or posterior to it; basal third or more of discal cell with a broad hyaline mark occupying entire width; cell bm broadly hyaline.

*Abdomen:* Tergites usually yellowish but sometimes with some lateral black spots on last segments or exceptionally entirely blackish (as in *H. nigriventris*, n. sp.).

*Female terminalia* (Figs. 2A–H, 3A–B): Aculeus always shorter than length of syntergosternite 7 (approximately 0.4–0.7 times its length); aculeus tip nonserrate; usually simple or bilobed at end (as in *H. bifurcata*, n. sp.), and usually with a sharply narrowed area in which there is often a step-like bend in lateral margin.

*Male terminalia* (Figs. 3C–D): Proctig-

er with a sclerotized region ventrally; outer surstylus very elongate and curved posteriorly, apex hook shaped dorsally; inner surstylus half as long as outer surstylus; with two short toothlike well defined prenisetae.

**Diagnosis.**—Ocellar bristle well developed; base of vein Cu always covered with at least a few microsetae on dorsal surface; setulae on disk of scutellum always present; apex of aculeus tip simple or bilobed, lateral margin nonserrate but usually with a sharply narrowed area. Most of these characters are shared only with species like *H. eximia* (Wiedemann), *H. dinia* (Walker), *H. enderleini* Lima, *H. seabrai* Lima, and others related under “first division” (see Lima 1953b). However, the species of the *colombiana* group differ from these by the presence of a ventral sclerite on the base of proctiger’s male; while the second hyaline mark in cell r1 usually extends to the inferior margin of wing, meaning that the discal and subapical bands are completely separated, or sometimes they are weakly connected on vein CuA1 or posterior to it.

**Remarks.**—The *colombiana* species group is widely distributed from southern Mexico (Chiapas) to Argentina, but most of the known species occur in northern South America (Colombia, Venezuela, and Ecuador). To date we have no information about their host plants.

KEY TO SPECIES OF THE *COLOMBIANA* GROUP

- 1. Abdominal tergites entirely yellow or sometimes with small lateral blackish spots on tergite 5 in male or 6 in female; sytergosternite 7 yellow or dark brown; aculeus tip variable . . . . . 2
- Abdominal tergites entirely brownish black, including sytergosternite 7; aculeus tip (Figs. 2E–F) with a pronounced narrowing on each side forming an angle less than 90°, part apical to narrowing very short and slender . . . . .  
 . . . . . *H. nigriventris*, n. sp.
- 2. Aculeus tip (Fig. 2A–B) simple, without sharp narrowing on lateral margins and gradually tapering to apex; wing pattern (Fig. 1B) with discal and subapical bands joined in cell cul . . . . .  
 . . . . . *H. colombiana* Lima

- Aculeus tip (Figs. 2C–D, G–H, 3A–B) sharply narrowed, with distinct bend on lateral margin; wing pattern (Figs. 1A, C–D) with discal and subapical bands always completely separated . . . . . 3
- 3. Apical extreme of aculeus tip bilobed; aculeus extremely short, less than half length of sytergosternite 7 (Figs. 2G–H) . . . . .  
 . . . . . *H. bifurcata*, n. sp.
- Apical extreme of aculeus tip simple; aculeus always longer than half length of sytergosternite 7 . . . . . 4
- 4. Wing pattern (Fig. 1D) with bands extremely slender, subapical band (along vein dm-cu) similar in width to anterior apical band; aculeus tip (Figs. 3A–B) very sharply narrowed with angle of approximately 90° on lateral margin at narrowed area. . . . . *H. leptofasciata*, n. sp.
- Wing pattern (Fig. 1C) with bands broader, subapical band (along vein dm-cu) two times as broad as anterior apical band; aculeus tip (Figs. 2C–D) with less pronounced narrowed area, with angle of more than 100° in lateral margin . . . . . *H. ecuatoriana*, n. sp.

*Hexachaeta colombiana* Lima  
(Figs. 1B, 2A–B, 3C)

*Hexachaeta colombiana* Lima 1953b: 560 (original description, wing, genitalia); Foote 1967: 26 (in Neotropical catalog).

**Type material.**—Holotype ♂ USNM (examined): COLOMBIA, Cundinamarca, 1933, L.M. Murillo. 2 slides #10 USNM wing + terminalia of male.

**Material examined.**—COLOMBIA: Anolaima, XI-1977, McPhail trap (3♂, 2♀ USNM); Santander del Sur, Barbosa 1530 m, 3-VIII-1994, E. Molina col. (4♂, 10♀ IEXA); COSTA RICA: Cartago, Chirripo, Turrialba, Grano de Oro 1120 m, IX-1992, P. Campos L-N 200250, 595900 (1♂ IN-BIO CRI000918933); Prov. Puntarenas, Jardín Las Cruces, 6 Km S San Vito on Rt 16, 29-V-1987, McPhail trap, A.L. Norrbom & R. Mexzon (1♂, 1♀ USNM).

**Description.**—*Head:* 1.32–1.8 mm high, 0.88–1.2 mm wide in lateral view; ocellar bristle well developed (at least as long as postocellar bristle); postocellar seta brownish black; arista only with sparse short hairs on apical third.

*Thorax:* Mesonotum 2.46–2.59 mm



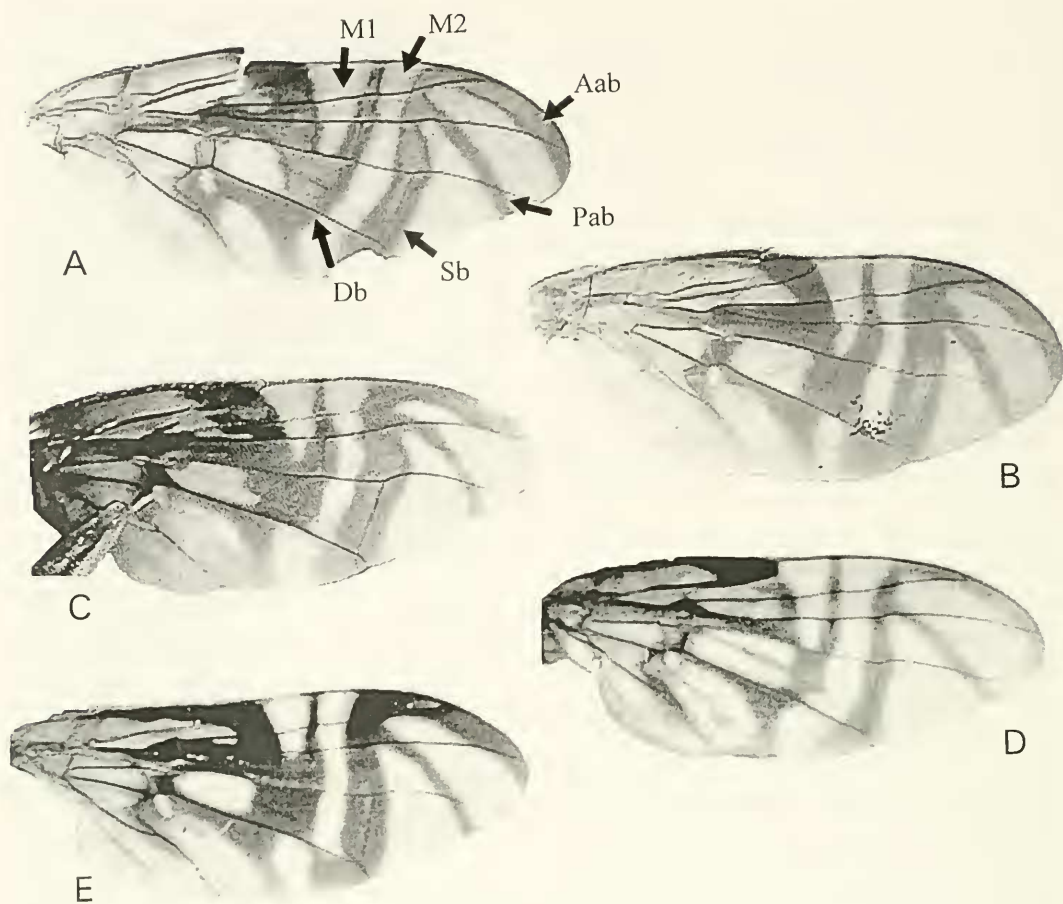


Fig. 1. Wing pattern of species of the *Hexachaeta colombiana* group and nomenclature used in text. A, *H. bifurcata*. B, *H. colombiana*. C, *H. ecuatoriana*. D, *H. leptofasciata*. E, *H. nigriventris*. M1 = first hyaline mark (or proximal); M2 = second hyaline mark (or distal); Db = discal band; Sb = subapical band; Aab = anterior apical band; Pab = posterior apical band.

long; scutum completely yellow and covered by setulae of same coloration extending onto disc of scutellum; margins of scutellum slightly paler yellow than disc; pleuron sclerites, subscutellum and mediotergite entirely yellow; legs yellow.

*Wing* (Fig. 1B): Length 5.6–6.84 mm; costal cell mostly yellow; bands of wing pattern brownish black with two hyaline markings in cell r1; first (proximal) extended to or almost to vein M, and second (distal) broadly projected into discal cell; discal and subapical bands joined only on vein CuA1 and in cell cu1; vein Cu covered by some dorsal microsetae to level of fork of

Cu1 and Cu2; basal third of discal cell broadly hyaline; abdominal tergites completely yellow.

*Male terminalia* (Fig. 3C): Epandrium mostly brownish black; proctiger relatively short and with a conspicuous ventral sclerite basally; outer surstylus strongly curved posteriorly, dorsally with a small preapical hook; inner surstylus broad and half as long as outer surstylus; two prensisetae tooth-shaped, short, but well developed.

*Female terminalia*: Syntergosternite 7 brownish black, contrasting with yellow abdominal tergites, length 1.9–2.19 mm, approximately as long as total length of pre-

abdomen; aculeus (Figs. 2A–B) 1.24–1.43 mm long, tip simple, tapering gradually to apex without any sharp angles in lateral margin.

Distribution.—Colombia, Costa Rica.

Remarks.—This species was previously known only from the holotype male, and the female terminalia is described here for the first time. The Costa Rican specimens show some variation in the wing pattern because the anterior apical band is broader than in the rest of material examined, but all characteristics of the aculeus are similar, showing that these specimens are conspecific.

***Hexachaeta ecuatoriana* Hernández,  
new species**

(Figs. 1C, 2C–D, 3D)

Type material.—Holotype ♀ CNC: EC-UADOR, Quitasol R. 50 km SW Quito, 2400 m, Pichincha, 24-25-II-65, Peña (teneral female). Paratypes: Same data as holotype (1 ♀ teneral CNC); Pimo (N Cañar) 3200 m, XII-1970, L.E. Peña col. (1 ♂ USP).

Description.—Female: *Head*: Yellow, 1.72–1.96 mm high and 1.12–1.24 mm wide in lateral view; frons reddish; ocellar bristle long and well developed (longer than postocellar bristle); postocellar bristle black; fascial carina poorly differentiated; arista bare on basal two thirds, apical third with some short and scarce hairs; genal bristle reddish.

*Thorax*: Mesonotum 3.06–3.21 mm long; scutum uniformly reddish brown extending this coloration into disc of scutellum; setulae of scutum and scutellum brownish uniformly distributed; pleuron sclerites, mediotergite and legs completely yellow.

*Wing* (Fig. 1C): 8.16–9.0 mm long, with a pattern of dark brown bands, with costal cell yellow as well as most of cells bm and cup; discal and subapical bands separated along entire length but relatively close together because subapical band broader than

in other species; anterior apical band at least two times broader than posterior apical band, and close to vein M. First hyaline marking in cell r1 projecting slightly beyond vein R4+5 but not reaching vein M; base of vein Cu with 9–10 microsetae on dorsal surface but not extending beyond fork of Cu1 and Cu2.

*Abdomen*: Tergites completely yellow, including syntergosternite 7, except its apical extreme a little darker; syntergosternite 7, 1.94 mm long; aculeus (Fig. 2C–D) 1.15 mm long (0.59 times as long as syntergosternite 7), tip tapering gradually, then more rapidly near midlength, to simple apex.

*Male*: Similar to female but with abdominal tergites 3–5 pigmented with a brownish-black spot on each side gradually widening to posterior segments; epandrium reddish; proctiger with a sclerotized plate ventrally. Outer surstylus long and curved posteriorly (Fig. 3D); inner surstylus reaching mid length of former, with two prensisetae short, toothlike and well developed.

Etymology.—The specific name is derived from the country of origin of the type material.

***Hexachaeta bifurcata* Hernández,  
new species**

(Figs. 1A, 2G–H)

Type material.—Holotype ♀ IEXA: MEXICO, Chiapas, Región del Soconusco (no date of collection). 2 slides, wing and abdomen + aculeus prep. IEXA Hex-09.

Description.—Female: *Head*: Yellow, 1.76 mm high and 1.20 mm wide in lateral view; most macrosetae lost, but due to large socket of ocellar bristle, apparently long and well developed; fascial carina very poorly developed.

*Thorax*: Mesonotum 3.65 mm long; scutum reddish yellow without any dark marks; setulae of scutum reddish brown and covering entire surface; discal region of scutellum covered by setulae of same color; pleuron sclerites, mediotergite, and legs yellow.

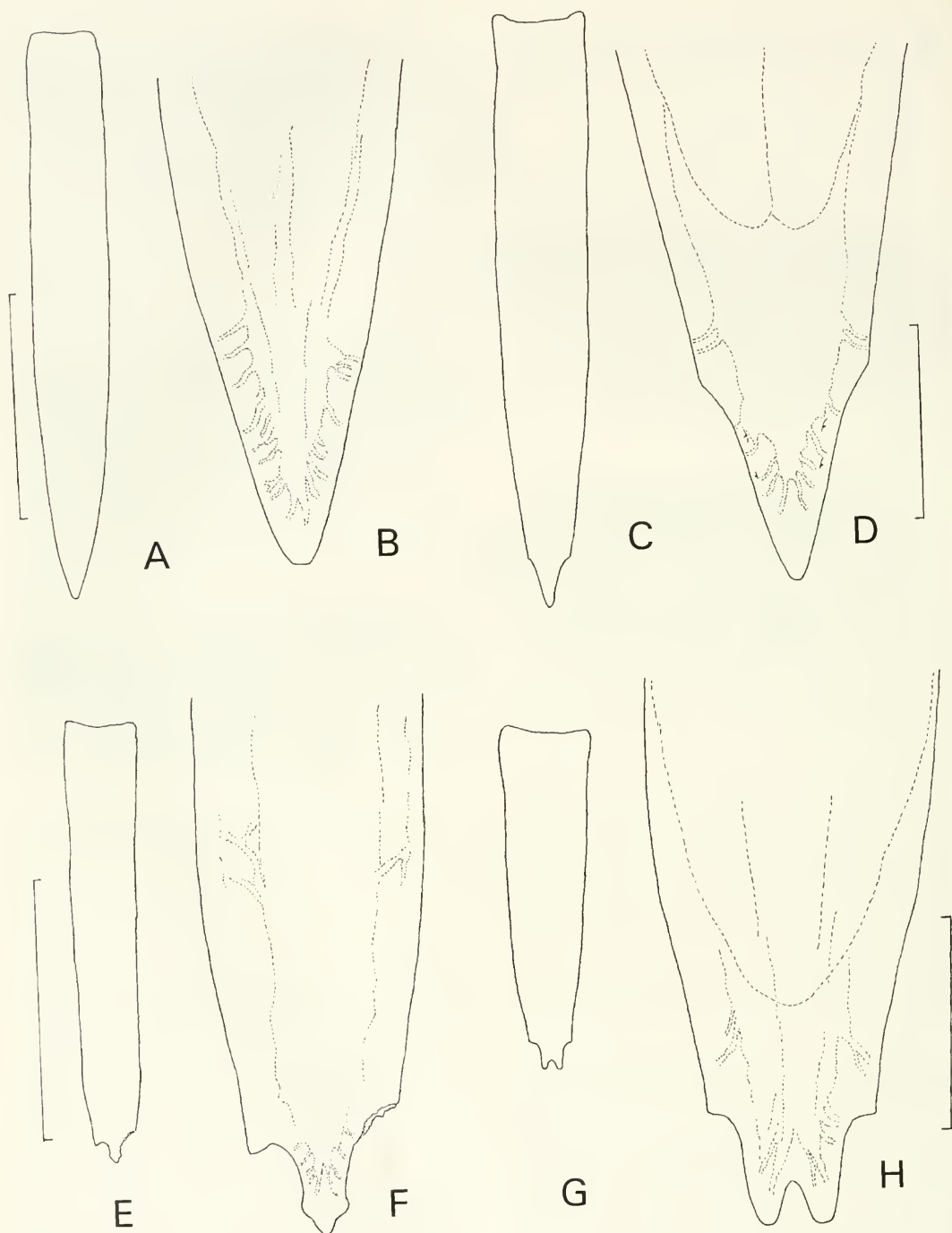


Fig. 2. Aculeus of *Hexachaeta* species, ventral view. A-B, *H. colombiana*, specimen from Colombia. C-D, *H. ecuatoriana*, holotype. E-F, *H. nigriventris*, holotype. G-H, *H. bifurcata*, holotype. A, C, E, G, general aspect of aculeus (line = 0.5 mm); B, D, F, H, aculeus tip (line = 0.1 mm).

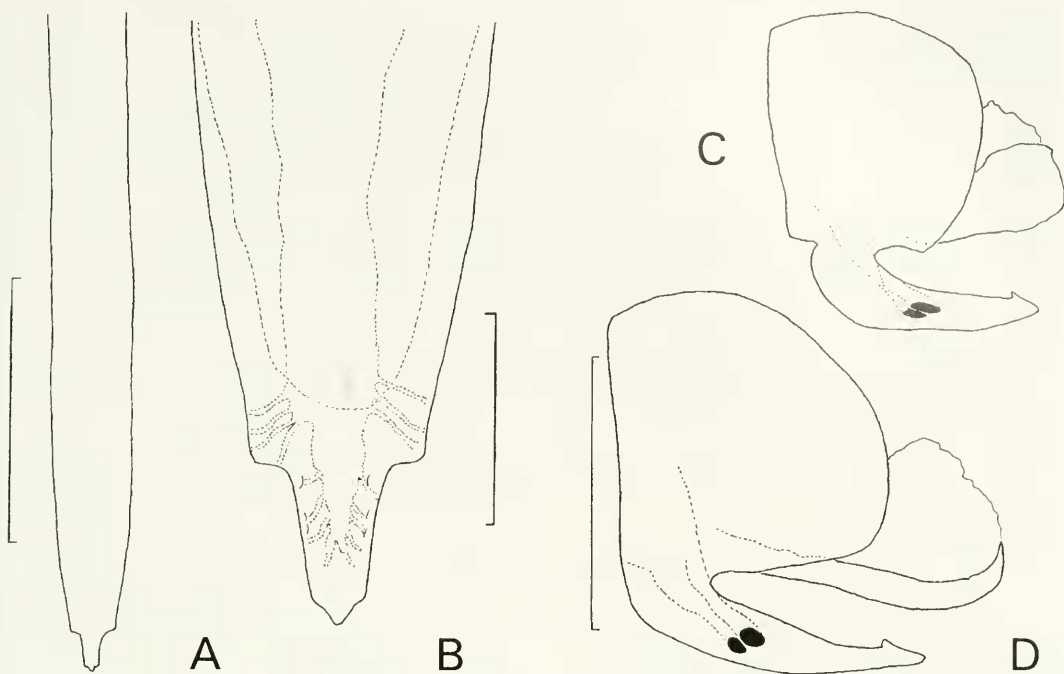


Fig. 3. Aculeus and male epandrium of *Hexachaeta* species. A–B, *H. leptofasciata*. A, general aspect of aculeus (line = 0.5 mm); B, aculeus tip (line = 0.1 mm). C, *H. colombiana*. D, *H. ecuatoriana*. C–D, male epandrium and surstyli in lateral view (line = 0.5 mm).

**Wing:** 8.42 mm long (Fig. 1A), with typical wing pattern of *colombiana* group; first hyaline marking in cell r1 reaching vein M, second hyaline marking extending to posterior margin of wing, thus discal and subapical bands completely separated; anterior and posterior apical bands present and moderately broad; base of vein Cu with 5–7 microsetae on dorsal surface and extending on to Cu1 to level of basal portion of discal cell.

**Abdomen:** Tergites mostly yellow or a little darker, with exception of segments 4 and 5 which have lateral blackish stripes that are larger on tergite 5. Syntergosternite 7 dark brownish, 1.60 mm long; aculeus (Figs. 2G–H) 0.62 mm long, extremely short (0.38 times as long as syntergosternite 7); aculeus tip near midlength with sharp turn in lateral margin of approximately 90°, and with extreme apex bilobed.

**Male:** Unknown.

**Etymology.**—The name is derived from

Latin in reference to the most important characteristic of the aculeus tip, unique among all known species of the *colombiana* group.

***Hexachaeta nigriventris* Hernández,  
new species**

(Figs. 1E, 2E–F)

**Type material.**—Holotype ♀ CAS: VENEZUELA, El Avila, D.F. “El Lagunazo” Parque Nacional, 3-IX-1977, John E. Lattke, Cal. Acad. Sci. Coll./as *Hexachaeta colombiana* Lima, det. Norrbom.

**Description.**—**Female:** **Head:** Yellow, 1.68 mm high and 0.92 mm wide in lateral view, but with sides of ocellar triangle slightly darker; fascial carina poorly developed; ocellar bristles lost, but with large sockets so apparently well developed.

**Thorax:** Mesonotum 3.06 mm long; scutum reddish yellow covered by pale yellow setulae; scutellum disc with dark brownish



setulae; all sclerites of pleuron, legs, and mediotergite reddish yellow, without any dark or blackish marks.

*Wing*: 7.32 mm long (Fig. 1E), with blackish pattern of broad bands; costal cell with dark marking occupying nearly all of anterior mid length; first triangular hyaline mark in cell r1 reaching vein R4+5, second hyaline mark broadly extended into discal cell; discal and subapical bands slightly joined along vein CuA1; anterior apical band broader than posterior apical band but not reaching vein M; base of vein Cu with 10–11 microsetae dorsally; subapical band at least two times broader than posterior apical band.

*Abdomen*: All tergites uniformly brownish black; syntergosternite 7 dark brown, 1.77 mm long; aculeus (Fig. 2E–F) 0.83 mm long (0.46 times as long as syntergosternite 7); aculeus tip sharply narrowed, lateral margin with bend of less than 90°, forming shallow lobe (one side broken in holotype); apex slender and slightly notched, not bilobed.

*Male*: Unknown.

*Etymology*.—Derived from the Latin *nigrum*, relating to the black coloration of all abdominal tergites.

***Hexachaeta leptofasciata* Hernández,  
new species**

(Figs. 1D, 3A–B)

*Type material*.—Holotype ♀ FML: ARGENTINA, Salta, Dpto. Orán, Ruta nac. 57 km 21 “El Chorro” 1,130 m, 28-X-1978, Col. P. Fidalgo.

*Description*.—*Female*: *Head*: Uniformly reddish, 1.64 mm high and 1.20 mm wide in lateral view; frons slightly darker on anterior half; ocellar bristle well developed, at least as long as postocellar bristle which is reddish brown; arista with short pilosity on apical half; genal bristle reddish.

*Thorax*: Mesonotum 2.96 mm long; scutum uniformly reddish brown and covered by yellow setulae extending onto disc of scutellum; sclerites of pleuron, medioter-

gite, and all legs reddish yellow without any dark markings.

*Wing* (Fig. 1D): 7.24 mm long, with bands well defined but conspicuously more slender than in other species of *colombiana* group; discal and subapical bands completely separated; discal cell with a broad hyaline marking at base extending to or almost to level of crossvein r-m; costal cell broadly hyaline; anterior apical band slender, not reaching vein M, approximately as broad as posterior apical band; base of vein Cu dorsally with 6–7 microsetae.

*Abdomen*: All tergites entirely yellow; syntergosternite 7 dark brownish, 1.99 mm long; aculeus (Figs. 3A–B) 1.44 mm long (0.72 times length of syntergosternite 7); aculeus tip sharply narrowed at basal ¼, with bend in lateral margin of near 90°, apex slender with notches, not bilobed.

*Male*: Unknown.

*Etymology*.—From the Latin *leptos* = slender and *fascia* = bands in reference to the slender wing bands of this species.

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